Conclusion

The applicant submits that the specification and claims are now in proper form, and that the revised claims define the invention patentably over the prior art.

Conditional Request For Constructive Assistance

The applicant is a first-time pro se inventor. The applicant has amended the specification and claims so that they are proper, definite, and define novel structure that is also unobvious. If the Examiner believes this application is not in full condition for allowance, the applicant respectfully requests the constructive assistance of the Examiner in accordance with MPEP 2173.02 and 707.07, in order that the applicant can place this application in allowable condition as soon as possible and without the need for further proceedings.

Respectfully yours,

K Jameson

Kevin W Jameson (Applicant Pro Se)

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FIG. 4

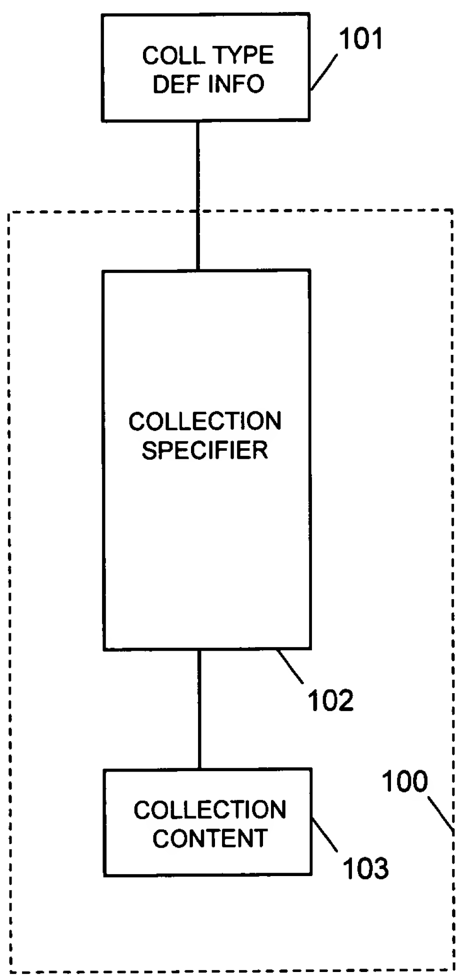
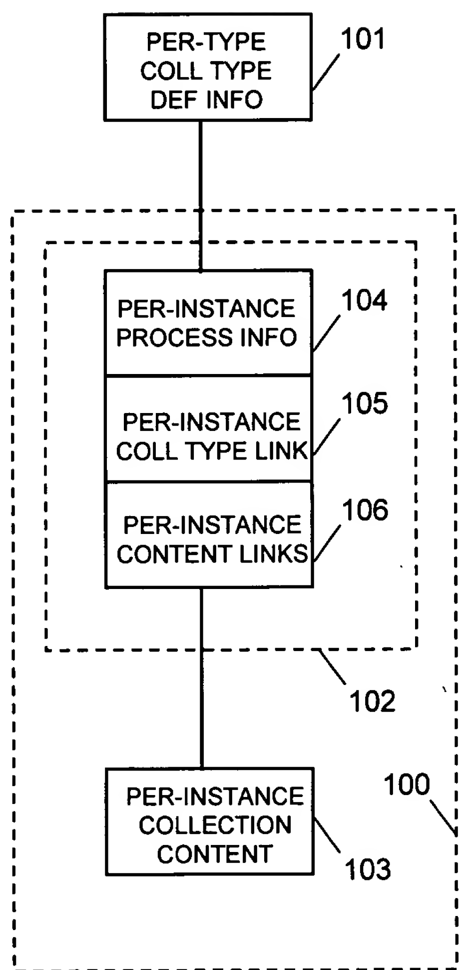


FIG. 5



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Patent Application of
Kevin W Jameson
For

COLLECTION MAKEFILE GENERATOR

CROSS REFERENCES TO RELATED APPLICATIONS

The present invention uses inventions from the following patent applications that are filed contemporaneously herewith, and which are incorporated herein by reference:

USPTO 09/885078
Collection Information Manager; Kevin Jameson.
USPTO 09/885076
Collection Content Classifier; Kevin Jameson.

FIELD OF THE INVENTION

This invention relates to automated software systems for processing collections of computer files in arbitrary ways, thereby improving the productivity of software developers, web media developers, and other humans and computer systems that work with collections of computer files.

important disadvantages. Notably, general prior art mechanisms do not provide fully automated support for collections, dynamic determination of content files, multiple products, extensive makefile variance, or parallel execution support.

In contrast, the present collection makefile generator invention has none of these limitations, as the following disclosure will show.

Specific Shortcomings in Prior Art

Several examples of prior art makefile generators are discussed below. The examples fall into two main categories: makefile generator programs and integrated development environment (IDE) programs. Both types of programs generate makefiles so that project source files can be processed efficiently in an automated manner.

Prior Art Makefile Generators

Makefile generator programs generate makefiles for humans who are building software programs. Typically, makefiles contain computer instructions for compiling source code files and linking compiled object files to produce executable files or libraries of object files. Also typically, programmers include a variety of other useful command sequences in makefiles to increase productivity.

delete

Some examples of popular freeware makefile generators include ~~GNU~~ automake, imake, and mkmf (make makefile). One example of a patented makefile generator is US Patent 5872977 "Object-Oriented Method and Apparatus For Creating A Makefile" by Thompson, which describes an object-oriented method of generating makefiles from input build files and input rule files. Although each of these prior art approaches is useful in some way, each approach has several important shortcomings.

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~~GNU~~ automake has no dynamic content discovery mechanism; instead it requires programmers to manually list all files that require processing. Neither does it have a

151 Calculate include search directories

152 Do file type definition services module

153 Do action type definition services module

160 Process makefile service module

161 Substitute makefile fragment module

162 Insert makefile fragment module

DETAILED DESCRIPTION

Overview of Collections

This section introduces collections and some related terminology.

Collections are sets of computer files that can be manipulated as a set, rather than as
COLLECTION INFORMATION IS
individual files. Collection are comprised of three major parts: (1) a collection specifier that contains information about a collection instance, (2) a collection type definition that contains information about how to process all collections of a particular type, and (3) optional collection content in the form of arbitrary computer files that belong to a collection.

Collection specifiers contain information about a collection instance. For example, collection specifiers may define such things as the collection type, a text summary description of the collection, collection content members, derivable output products, collection processing information such as process parallelism limits, special collection processing steps, and program option overrides for programs that manipulate collections. Collection specifiers are typically implemented as simple key-value pairs in text files or database tables.

FIG 1 shows an example prior art filesystem folder from a typical personal computer filesystem. The files and directories shown in this drawing do not implement a collection 100, because no collection specifier 102, FIG 2 Line 5 exists to associate a collection
FIG 4 101 FIG 4 103
type definition 101 with collection content information 103.

FIG 2 shows the prior art folder of FIG 1, but with a portion of the folder converted into a collection 100 by the addition of a collection specifier file FIG 2 Line 5 named "cspec".
FIG 4 103
In this example, the collection contents 103 of collection 100 are defined by two implicit policies of a preferred implementation.

First is a policy to specify that the root directory of a collection is a directory that contains a collection specifier file. In this example, the root directory of a collection 100 is a directory named "c-myhomepage" FIG 2 Line 4, which in turn contains a collection specifier file 102 named "cspec" FIG 2 Line 5.

Second is a policy to specify that all files and directories in and below the root directory of a collection are part of the collection content. Therefore directory "s" FIG 2 Line 6, file "homepage.html" FIG 2 Line 7, and file "myphoto.jpg" FIG 2 Line 8 are part of
FIG 4 103
collection content 103 for said collection 100.

FIG 3 shows an example physical representation of a collection specifier file 102, FIG 2 Line 5, such as would be used on a typical personal computer filesystem.

Collection Information Types

delete comprise collection information
Figures 4-5 show three ~~main~~ kinds of information that are managed by collections.

that comprise collection information
FIG 4 shows a high-level logical structure of three types of information managed by collections: collection processing information 101, collection specifier information 102, and collection content information 103. A logical collection 100 is comprised of a

collection specifier 102 and collection content 103 together. This diagram best illustrates the logical collection information relationships that exist within a preferred filesystem implementation of collections.

FIG 5 shows a more detailed logical structure of the same three types of information shown in FIG 4. Collection type definition information FIG 4 101 has been labeled as per-type information in FIG 5 103 because there is only one instance of collection type information 101 per collection type. Collection content information FIG 4 103 has been labeled as per-instance information in FIG 5 103 because there is only one instance of collection content information per collection instance. Collection specifier information 102 has been partitioned into collection instance processing information 104, collection-type link information 105, and collection content link information 106. FIG 5 is intended to show several important types of information 104-106 that are contained within collection specifiers 102.

FIG 6 110

Suppose that an application program means 110 knows (a) how to obtain collection processing information 101, (b) how to obtain collection content information 103, and (c) how to relate the two with per-collection-instance information 102. It follows that application program means 110 would have sufficient knowledge to use collection processing information 101 to process said collection content 103 in useful ways.

Collection specifiers 102 are useful because they enable all per-instance, non-collection-content information to be stored in one physical location. Collection content 103 is not included in collection specifiers because collection content 103 is often large and dispersed among many files.

All per-collection-instance information, including both collection specifier 102 and collection content 103, can be grouped into a single logical collection 100 for illustrative purposes.

Virtual Platforms

As can be appreciated from the foregoing discussion, a large number of makefile fragments are required to effectively model the makefile needs of a typical industrial software environment. For example, several hundreds of fragments might be involved.

One helpful technique for managing large numbers of fragments is to organize them into virtual platform directories, and then use virtual platform search directories to find specific fragment files. A virtual platform is one that is invented by fragment administrators to represent a desired abstraction level for sharing makefile information.

There are two main benefits of this approach.

The first benefit is that information can be more easily shared at various operating system abstraction levels. For example, virtual platform "pi" information can be shared among gnulinux
all platforms, virtual platform "gnulinux" information can be shared among all GNUlinux gnulinux2
systems, and virtual platform "gnulinux2" information can be used only by Gnulinux2 systems.

The second benefit is that virtual platform search rules make it possible to more easily override more generic information with more specific information. For example, placing "gnulinux2" ahead of "pi" in a set of virtual platform search rules ensures that the "gnulinux2" version of a same-named file will always be found before the "pi" version of the same-named file.

FIG 59 shows a table of virtual platforms, with associated search directories.

delete

FIG 60 shows two examples of how virtual platform entries from the ~~the~~ table of FIG 59 can be converted into virtual platform search rules, or search directories.

For example, FIG 59 Line 6 contains a virtual platform entry for the "gnulinux2" virtual

Administrative parallelism is determined by administrative policy. This is because system administrators may want to limit the computational resources that can be accessed by any one parallel computation. For example, parallel calculations can generate significant amounts of computer load, so system administrators may want to protect other system users from big parallel calculations that hog scarce computational resources.

Useful parallelism is the maximum amount of parallelism that can usefully be applied to a particular computation under particular parallelism limits. Suppose that administrative parallelism limits are set high enough to be ignored. Then useful parallelism would be calculated as the minimum of problem parallelism and physical parallelism.

Parallel Target Examples

FIG 62 shows examples of parallel targets and how they are used.

Line 3 shows a sequential makefile target that has 100 object file dependencies. As written, Line 3 will cause the 100 object files to be compiled in sequence.

a make

Line 8 shows how parallelism can be obtained using the GNU Make program, which is capable of spawning multiple parallel computational processes using sequential targets. delete ~~GNU~~ Make accepts a control argument "-j N" that specifies the number of parallel processes to spawn. In this example, 4 parallel processes are requested. Thus ~~GNU~~ make would simultaneously build file-001.o through file-004.o. delete

Lines 12-16 shows an example set of parallel targets that might be generated by the present makefile generator invention. Line 12 is the top level target, with 4 dependencies that are the 4 parallel targets.

Lines 13-16 are parallel targets, each responsible for building 25 of the 100 example object files.

CLAIMS

I claim:

Replace claim 1 with revised claim 1.

1. A collection makefile generator process for generating makefiles for collections, comprising the following steps:

   (a) receiving a request to generate a makefile for a collection,

   (b) accessing collection information for said collection, and

   (c) generating a makefile for said collection,

   thereby providing a solution to the collection makefile generator problem, and

   thereby enabling human programmers to generate collection makefiles in a fully-automated, scalable way that was not previously available.

2. The process of claim 1, wherein

   (a) said step of generating a makefile uses makefile service and makefile fragment template information,

   thereby providing a solution to the makefile customization problem, and

   thereby enabling human programmers to extensively customize the makefile generation process by controlling the information content of fragments used to implement makefile services, in an automated, scalable way that was not previously available.

output products from a single collection, even where said multiple products must be processed in a particular build order in order to ensure correct results.

8. The process of claim 1, wherein

(a) said step of generating a makefile uses file build order information,

thereby providing a solution to the product file build order problem, and

thereby enabling human programmers to specify a proper build order for multiple product file types within a single collection product, even where the multiple product files must be processed in a particular build order in order to ensure correct results.

9. The process of claim 1, wherein

(a) said step of generating a makefile uses parallelism limit information to calculate and generate parallel makefile targets,

thereby providing a solution to the makefile parallel processing problem, and

thereby increasing the productivity of human programmers by generating makefiles that can be executed in parallel to reduce the time required to perform makefile operations.

10. A programmable collection makefile generator device for generating makefiles for collections, whose actions are directed by software executing a process

Replace claim 10 with revised claim 10.

comprising the following steps:

Replace claim 10 with revised claim 10.

(a) receiving a request to generate a makefile for a collection,

(b) accessing collection information for said collection, and

(c) generating a makefile for said collection,

thereby providing a solution to the collection makefile generator problem, and

thereby enabling human programmers to generate collection makefiles in a fully-automated, scalable way that was not previously available.

11. The programmable device of claim 10, wherein

(a) said step of generating a makefile uses makefile service and makefile fragment template information,

thereby providing a solution to the makefile customization problem, and

thereby enabling human programmers to extensively customize the makefile generation process by controlling the information content of fragments used to implement makefile services, in an automated, scalable way that was not previously available.

12. The programmable device of claim 10, wherein

(a) said step of generating a makefile uses substitution strings representing

17. The programmable device of claim 10, wherein

(a) said step of generating a makefile uses file build order information,

thereby providing a solution to the product file build order problem, and

thereby enabling human programmers to specify a proper build order for multiple product file types within a single collection product, even where the multiple product files must be processed in a particular build order in order to ensure correct results.

18. The programmable device of claim 10, wherein

(a) said step of generating a makefile uses parallelism limit information to calculate and generate parallel makefile targets,

thereby providing a solution to the makefile parallel processing problem, and

thereby increasing the productivity of human programmers by generating makefiles that can be executed in parallel to reduce the time required to perform makefile operations.

19. A computer readable memory, encoded with data representing a collection makefile generator program that can be used to direct a computer when used by the computer, comprising:

(a) means for receiving a request to generate a makefile for a collection,

Replace claim 19 with revised claim 19.

Replace claim 19 with revised claim 19.

(b) means for accessing collection information for said collection, and

(c) means for generating a makefile for said collection,

thereby providing a solution to the collection makefile generator problem, and

thereby enabling human programmers to generate collection makefiles in a fully-automated, scalable way that was not previously available.

20. The computer readable memory of claim 19, wherein

(a) said means for generating a makefile uses makefile service and makefile fragment template information,

thereby providing a solution to the makefile customization problem, and

thereby enabling human programmers to extensively customize the makefile generation process by controlling the information content of fragments used to implement makefile services, in an automated, scalable way that was not previously available.

21. The computer readable memory of claim 19, wherein

(a) said means for generating a makefile uses substitution strings representing collection instance values to replace placeholder strings in makefile fragments,

thereby providing a solution to the multiple product naming problem, and